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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 09/13/2004
Jerry W. Herndon
IBM Corporation T81/503
PO Box 12195
Research Triangle Park, NC 27709

EXAMINER	
CHEN, CHONGSHAN	
ART UNIT	PAPER NUMBER
2172	17
DATE MAILED: 09/13/2004	

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/753,992	01/03/2001	Sanjay Khanna	RSW919990130US1	1791
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TITLE OF INVENTION: TECHNIQUE FOR SERIALIZING DATA STRUCTURE UPDATES AND RETRIEVALS WITHOUT REQUIRING SEARCHERS TO USE LOCKS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1330	\$300	\$1630	12/13/2004

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. **PROSECUTION ON THE MERITS IS CLOSED.** THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN **THREE MONTHS** FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. **THIS STATUTORY PERIOD CANNOT BE EXTENDED.** SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.
- B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

- A. Pay TOTAL FEE(S) DUE shown above, or
- B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail**

**Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (703) 746-4000**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (703) 746-4000, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

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TITLE OF INVENTION: TECHNIQUE FOR SERIALIZING DATA STRUCTURE UPDATES AND RETRIEVALS WITHOUT REQUIRING SEARCHERS TO USE LOCKS

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nonprovisional	NO	\$1330	\$300	\$1630	12/13/2004

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHEN, CHONGSHAN	2172	707-003000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, _____ 1

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. _____ 2

_____ 3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s):

- ☐ A check in the amount of the fee(s) is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 226 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 226 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (703) 305-1383. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.



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Notice of Fee Increase on October 1, 2004

If a reply to a "Notice of Allowance and Fee(s) Due" is filed in the Office on or after October 1, 2004, then the amount due will be higher than that set forth in the "Notice of Allowance and Fee(s) Due" because some fees will increase effective October 1, 2004. See Revision of Patent Fees for Fiscal Year 2005; Final Rule, 69 Fed. Reg. 52604, 52606 (May 10, 2004).

The current fee schedule is accessible from WEB site (<http://www.uspto.gov/main/howtofees.htm>).

If the fee paid is the amount shown on the "Notice of Allowance and Fee(s) Due" but not the correct amount in view of the fee increase, a "Notice of Pay Balance of Issue Fee" will be mailed to applicant. In order to avoid processing delays associated with mailing of a "Notice of Pay Balance of Issue Fee," if the response to the Notice of Allowance is to be filed on or after October 1, 2004 (or mailed with a certificate of mailing on or after October 1, 2004), the issue fee paid should be the fee that is required at the time the fee is paid. See Manual of Patent Examining Procedure (MPEP), Section 1306 (Eighth Edition, Rev. 2, May 2004). If the issue fee was previously paid, and the response to the "Notice of Allowance and Fee(s) Due" includes a request to apply a previously-paid issue fee to the issue fee now due, then the difference between the issue fee amount at the time the response is filed and the previously-paid issue fee should be paid. See MPEP Section 1308.01.

Effective October 1, 2004, 37 CFR 1.18 is amended by revising paragraphs (a) through (c) to read as set forth below.

Section 1.18 Patent post allowance (including issue) fees.

- (a) Issue fee for issuing each original or reissue patent, except a design or plant patent:
- By a small entity (Sec. 1.27(a))..... \$685.00
 - By other than a small entity..... \$1,370.00
- (b) Issue fee for issuing a design patent:
- By a small entity (Sec. 1.27(a))..... \$245.00
 - By other than a small entity..... \$490.00
- (c) Issue fee for issuing a plant patent:
- By a small entity (Sec. 1.27(a))..... \$330.00
 - By other than a small entity..... \$660.00

Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

Notice of Allowability

Application No.

09/753,992

Examiner

Chongshan Chen

Applicant(s)

KHANNA ET AL.

Art Unit

2172

17/F

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 8/24/04.
2. ☒ The allowed claim(s) is/are 25,27 and 29-45.
3. ☐ The drawings filed on _____ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 16.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.


SHAHID ALAM
PRIMARY EXAMINER

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Marcia L. Doubet on 8 September 2004.

The application has been amended as follows:

Please replace claims 25, 27, 29, 33, 37 and 43 as follow:

Claims 25. A method of searching and updating indexes to data in a multi-processing environment, comprising steps of:

creating two identical indexes, both indexes representing an initial state for accessing a single copy of data, a first index for searching and a second index for updating;

updating the second index;

responsive to each update of the second index, switching the indexes so that the first index becomes the second index and the updated second index becomes the first index;

allowing searches that are in progress using the first index, before switching the indexes, to continue until completion after switching the indexes, using the newly-switched second index;

after switching the indexes, initiating new searches using the newly-switched first index;

when all searches in the newly-switched second index have completed, updating the newly-switched second index in an identical manner as the update to which the switching step was responsive; and

preventing another operation of the switching step until completion of the step of updating the newly-switched second index in the identical manner.

Claim 27. A program product storage medium containing computer instructions that when executed in a computer perform a method of searching and updating indexes to data in a multi-processing environment, the method comprising steps of:

creating two identical indexes, both indexes representing an initial state for accessing a single copy of data, a first index for searching and a second index for updating;

updating the second index;

responsive to each update of the second index, switching the indexes so that the first index becomes the second index and the updated second index becomes the first index;

allowing searches that are in progress using the first index, before switching the indexes, to continue until completion after switching the indexes, using the newly-switched second index;

after switching the indexes, initiating new searches using the newly-switched first index;

when all searches in the newly-switched second index have completed, updating the newly-switched second index in an identical manner as the update to which the switching step was responsive; and

preventing another operation of the switching step until completion of the step of updating the newly-switched second index in the identical manner.

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Claim 29. A computer program product for serializing data structure retrievals and updates in a multi-processing computer system, the computer program product embodied on one or more computer-readable media and comprising:

 computer-readable program code means for creating two identical data structures, both representing an initial state for accessing a single copy of stored data;

 computer-readable program code means for performing searches against a first of the two data structures, the computer-readable program code means for performing searches further comprising a first program instruction for incrementing a search use count for the first data structure atomically during each search to ensure no interference from other processes during that search and a second instruction for decrementing the search use count for the first data structure atomically after performing each search;

 computer-readable program code means for performing a first update against a second of the two data structures, yielding a revised data structure;

 computer-readable program code means for switching the first data structure and the revised data structure, responsive to completion of the computer-readable program code means for performing the first update, such that the first data structure becomes the second data structure and the revised data structure becomes the first data structure, the computer-readable program code means for switching the data structures further comprising a third instruction for re-ordering data structure pointers atomically to prevent interference from other processes during operation of the computer-readable program code means for switching; and

computer-readable program code means for applying, after operation of the computer-readable program code means for switching, the first update against the second data structure, yielding a second data structure that is structurally identical to the first data structure, when the search use count for the second data structure has a value indicating that no searches are being performed against the second data structure.

Claim 33. A computer system for serializing data structure retrievals and updates in a multi-processing computer system, the computer system comprising:

means for creating two identical data structures, both representing an initial state for accessing a single copy of stored data;

means for performing searches against a first of the two data structures, the means for performing searches further comprising means for incrementing a search use count for the first data structure atomically during each search to ensure no interference from other processes during that search and means for atomically decrementing the search use count for the first data structure after performing each search;

means for performing a first update against a second of the two data structures, yielding a revised data structure;

means for switching the first data structure and the revised data structure, responsive to completion of the means for performing the first update, such that the first data structure becomes the second data structure and the revised data structure becomes the first data structure, the means for switching the data structures further comprising means for re-ordering data

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structure pointers atomically to prevent interference from other processes during operation of the means for switching; and

means for applying, after switching the data structures, the first update against the second data structure, yielding a second data structure that is structurally identical to the first data structure, when the search use count for the second data structure has a value indicating that no searches are being performed against the second data structure.

Claim 37. A method for serializing data structure retrievals and updates in a multi-processing computer system, comprising steps of:

creating two identical data structures, both representing an initial state for accessing a single copy of stored data;

performing searches against a first of the two data structures, the performing searches step further comprising the step of incrementing a search use count for the first data structure atomically during each search to ensure no interference from other processes during the search and the step of decrementing the search use count for the first data structure atomically after performing each search;

performing a first update against a second of the two data structures, yielding a revised data structure;

switching the first data structure and the revised data structure, responsive to completion of the step of performing the first update, such that the first data structure becomes the second data structure and the revised data structure becomes the first data structure, the step of switching

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the data structures further comprising the step of re-ordering data structure pointers atomically to prevent interference from other processes during operation of the switching step; and

applying, after the switching step, the first update against the second data structure, yielding a second data structure that is structurally identical to the first data structure, when the search use count for the second data structure has a value indicating that no searches are being performed against the second data structure.

Claim 43. A method of serializing access to data in a computing system, comprising steps of:

creating two trees as indexes, both indexes representing an initial state for accessing a single copy of data, a first of which is used for searches and a second of which is used for update operations, each tree having a use count associated therewith;

carrying out searches using the search tree, further comprising the steps of:

determining, for each new search request, which of the trees is currently the search tree;

incrementing the use count for the search tree;

performing the new search request using the search tree; and

decrementing the use count for the search tree, responsive to completion of the performing step; and

carrying out each update using the update tree, further comprising the steps of:

determining which of the trees is currently the update tree;

performing an update to the update tree;

serializing a record describing the update to the update tree;

switching the update tree to become the search tree and the search tree to become the update tree, responsive to completion of the steps of performing the update and serializing the record; and

applying the serialized record to the newly-switched update tree, provided that the use count for the newly-switched update tree has reached a value that indicates that no search requests are currently being performed against this newly-switched update tree, delaying the step of applying the serialized record if necessary until the use count for the newly-switched update tree has reached this value, and wherein the step of applying the serialized record ensures that both the search tree and the update tree reflect each update.

Reasons For Allowance

2. As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

3. Claims 25, 27 and 29-45 are allowed.

4. The following is an examiner's statement of reasons for allowance:

The prior art of record does not teach or fairly suggest creating two identical indexes, both indexes representing an initial state for accessing a single copy of data, a first index for searching and a second index for updating; updating the second index; responsive to each update of the second index, switching the indexes so that the first index becomes the second index and the updated second index becomes the first index; allowing searches that are in progress using the first index, before switching the indexes, to continue until completion after switching the indexes, using the newly-switched second index; after switching the indexes, initiating new searches using the newly-switched first index; when all searches in the newly-switched second index have completed, updating the newly-switched second index in an identical manner as the update to which the switching step was responsive; and preventing another operation of the switching step until completion of the step of updating the newly-switched second index in the identical manner.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chongshan Chen whose telephone number is 703-305-8319. The examiner can normally be reached on Monday - Friday (8:00 am - 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Breene can be reached on (703)305-9790. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 8, 2004


SHAHID ALAM
PRIMARY EXAMINER